How to cite:
Peppoloni S., Bobrowsky P., Di Capua G. (2015). Geoethics: A Challenge for Research Integrity in Geosciences, pp. 287-294, doi: 10.1142/9789814632393_0035. In: Steneck N., Anderson M., Kleinert S., Mayer T. (Eds.). Integrity in the Global Research Arena. May 2015, 336 pp., World Scientific Publishing Co, ISBN: 978-981-4632-38-6.

GEOETHICS: A CHALLENGE FOR RESEARCH INTEGRITY IN GEOSCIENCES

Silvia Peppoloni
International Association for Promoting Geoethics
Istituto Nazionale di Geofisica e Vulcanologia, Italy

Peter Bobrowsky
International Association for Promoting Geoethics,
Geological Survey of Canada, Canada

Giuseppe Di Capua
International Association for Promoting Geoethics
Istituto Nazionale di Geofisica e Vulcanologia, Italy

Introduction

Geoethics reflects the intersection of geology, sociology and philosophy and frequently focuses on important environmental issues and problems often related to natural risk management and mitigation. Geoethics promotes a critical analysis of the use of natural resources, highlighting educational and communication aspects in sciences. Above all, Geoethics encourages geoscientists to assume responsibility in carrying out their research activities with the greatest integrity, especially since such activities can effectively contribute in guiding civil society and industry towards adopting sustainable practices in relation to the Geosphere. The research in Geoethics is multidisciplinary in nature, often requiring a team of experts of different backgrounds.
In Geoethics the research integrity involves the collective conscience of the team members and their obligations to society. As Geoethics is a relatively new branch of geosciences, some aspects of research integrity are yet to be fully developed. Herein we highlight three important elements to be considered: 1) the concept of responsibility for the scientists; 2) the awareness of the value of their knowledge; and, 3) the identification of an ethical criterion, based first on intellectual honesty. On the basis of these principles the research activity can become a service for the benefit of others. The newly formed International Association for Promoting Geoethics proposes to tackle these and other related issues.

Ethical and social implications of scientific research

Scientific research has obvious repercussions on society. So the adoption of ethical principles and standards is essential for a responsible practice of research (Mayer & Steneck, 2011).
Scientists are expected to behave with intellectual honesty and put society's needs first in all their activities. Geoscientists possess essential scientific knowledge to complete appropriate studies and this implies moral obligations, especially the practical consequences of their actions.
The geoscientist is a "searcher of truth" and not just a "research employee". And the research of truth implies an ethical commitment to safeguard the common good. For some scientific disciplines, such as Biology, Medicine or Physics, these considerations are even more evident.
Moreover, scientists can productively contribute to bring science closer to all the components of society. In fact, if society is not sufficiently involved in the acquisition of scientific knowledge, one could have two negative consequences: on the one hand the cultural and social marginalization of

scientists, with a loss of sense of their role, on the other the tendency of people to embrace preconceived ideas in non-critical ways, with ideas sometimes provided by the media, possibly incorrect, potentially resulting in loss of good sense or in irrational behavior.
Thus, scientists have an ethical responsibility towards citizens and the scientific community to which they belong. It includes:

- Making data and results of their research public, easily accessible and user friendly;
- Transferring advanced knowledge to industry and authorities;
- Participating in the realization of educational campaigns for the population, paying attention to scientific communication, simplifying concepts, without making them banal;
- Collaborating in the training of skills for technicians and professionals;
- Assuring their own ongoing professional training;
- Developing their research, without over confidence in their own results, verifying the sources of information and the adherence of results to observations;
- Accepting a fair debate with various hypotheses and theories that may disagree;
- Assessing the uncertainties and errors of the results of their studies.

All these considerations are relevant to the Earth Sciences. Earth scientists study the entire Planet Earth, all of its processes and phenomena and the links between these and human activities. Such scientists aim to understand the natural world in order to understand the variables that influence processes and predict the effects of those phenomena involved in its dynamics, with the goal to improve people's lives and "protect" the Planet. The ethical and social implications are evident, so Geoethics is necessary to change one's approach to the Geosphere: without an ethical approach, Earth Sciences run the risk of becoming a body of conventional knowledge, not oriented towards the common good and human progress (Peppoloni & Di Capua, 2012; Pievani, 2012).

What is Geoethics

Geoethics consists of research and reflection on those values upon which one bases appropriate behavior and practices in situations where human activities intersect the Geosphere. Geoethics deals with the ethical, social and cultural implications of using Earth sciences for societal benefits. It is thus a meeting point of Geology, Sociology and Philosophy (Peppoloni & Di Capua, 2012).
But above all, Geoethics represents an opportunity for geoscientists to become more conscious of their social role and responsibilities in conducting their research and in increasing the awareness of society regarding problems related to natural resources and environment. Moreover, Geoethics:

- Provides references and guidelines for finding solutions to environmental problems compatible with a respect for Nature;
- Encourages a critical analysis in the use and management of natural resources, promoting their eco-friendly development;
- Deals with problems related to the management, communication, education and mitigation of natural risks, fostering the proper and correct dissemination of the results of scientific studies and information on the risks.

From this perspective, the socio-cultural role played by geoscientists is essential. Through their research, they can promote a culture, sensitive to the environment and a more constructive relationship between the scientific community, mass media, civil society and policy-makers. Geoscientists can educate people that natural resources and the environment constitute a common heritage, which should be considered for its scientific, cultural and educational value, as well as a social capital. But what does the responsibility of geoscientists comprise? Are geoscientists well-

equipped to undertake this responsibility? And what motivations are needed to push geoscientists to conduct their research in an ethical way?

The responsibility of geoscientists

It is important to distinguish between an individual responsibility and a social responsibility (Peppoloni & Di Capua, 2012). The first is fundamental for any social actions. The Noble Prize in Physics recipient Werner Karl Heisenberg (1901 – 1976) considered the natural sciences not only as a tool to describe and interpret Nature, but also an opportunity for scientists to understand themselves. So, geoscientists, through their research, have the possibility to know not only the truth of natural phenomena, but also the truth about themselves (Heisenberg, 1958). The research can offer them a way to understand their own integrity and the relationship that links them, as scientists who act, to their own actions. Respect for truth and intellectual honesty gives sense to their studies. On these bases their actions can become an effective benefit for society, and as a result a social responsibility arises.

Geoscientists are an active and responsible part of society, at the service of the common good. Their social responsibility consists of:

- guaranteeing skills and training;
- working to the best of their possibilities honestly and ethically;
- sharing data and the obtained results of their research with other colleagues, in order to verify the accuracy of the analyses;
- paying attention to the correct communication of these results to the public;
- nourishing the pleasure of "a job well done".

In particular, comparing and sharing the results of research should not be seen as a threat, but rather as a guarantee of quality and an incentive for improvement.

An ethical criterion for the geoscientist

The ethical criterion that must guide scientists should be rooted in their individual sphere, that is, the source of any action even if it occurs within their social sphere. On this basis their research activity can become a true service for others (Peppoloni & Di Capua, 2012). The ethical criterion for a scientist should be that intellectual honesty is the main requirement. This includes:

- Respect for the truth as we look for our own ideas and for other's ideas;
- Recognition of the value of others;
- A spirit of collaboration and reciprocity;
- Identification of a common goal, despite the diversity of views;
- Responsibility derived from our technical-cultural expertise;
- Being opened to criticism and ready to question one’s own certainties;
- Reflection on the mutuality of knowledge and roles;
- Awareness that conveying scientific knowledge to others is valuable.

How can geoscientists, and especially the younger practitioners, be best assisted in their acquisition of a clear and binding awareness regarding their ethical responsibility in geosciences? The Italian Commission on Geoethics tried to answer the question with the proposal for adoption of a Hippocratic-like oath for geoscientists (Matteucci et al., 2012). A first proposal for this “oath” was presented on August 2012 in Brisbane, during the 34th International Geological Congress. It calls upon geoscientists to recognize values to be considered when conducting research activities, such as Geosphere protection, sustainability, social benefit; to include a proper use of scientific results, to

improve both knowledge and work honestly, as well as being aware of the limits of geoscientists' capabilities and possibilities.
What is the significance of an ethical obligation? In the context of a publicly growing demand for ethical behavior by those who, for whatever reason, have the possibility to intervene within the public domain and to act on behalf of the public weal, the explicit acceptance of the ethical responsibility by geoscientists can have the following effects:

- Favoring explicit awareness of their social role, expertise and contribution, to strengthen their sense of belonging to a professional community;
- Fostering the awareness of geoscientists of the expectations of citizens and society;
- Stimulating the cultural growth at the individual and community levels, the exploitation of research and the implementation of scientific and professional skills;
- Assuming the commitment for the cultural lifelong increase as an ethical duty.

The IAPG - International Association for Promoting Geoethics

Starting from the consideration that the guarantee for integrity of research depends on comparisons with others, the sharing of scientific results and considering that both these conditions need occasions for debate, in 2012 the IAPG (http://www.geoethics.org) was founded and recently obtained affiliation to the IUGS – International Union of Geological Sciences. The IAPG is an international, scientific, multidisciplinary platform, borne with the goal of widening the debate on problems of Ethics as applied to Geosciences research it is a forum for reflections on Geoscientists' skills, the quality of their work and the contribution that their studies can provide to the healthy progress of humanity. The IAPG aims to promote Geoethics values and principles through international cooperation, encouraging the involvement and debate of geoscientists, especially those belonging to less developed countries, and assuring a good coordination among these nations. The IAPG intends to foster the dissemination of Geoethics through a dedicated website, the publication of scientific papers, the organization of meetings and sessions/symposia on Geoethics within national and international geoscientific events.

Conclusions

Geoethics can increase the awareness of the value of research in geosciences as a way to contribute to the progress of mankind and thus highlight the necessity to respect some fundamental principles in conducting scientific activities.
According to the Singapore statement on research integrity (2010), principles such as honesty, accountability, professional courtesy and fairness as well as good stewardship have become the pillars in conducting scientific research in order to guarantee the respect for other's work and the truth of science. It is the responsibility of scientists to ensure the integrity and trustworthiness of their research, the adherence to regulations, the correct use of methods, avoiding conflicts of interest, and to pay particular attention to public communication.

References

Heisenberg, W., 1958. Physics and Philosophy, 206. New York: Harper and Brothers.
Matteucci R., Gosso G., Peppoloni S., Piacente S., Wasowski J., 2014. The "Geoethical Promise": A Proposal. Episodes, 37(3), 3, 190-191.
Mayer T. & Steneck N. (eds.), 2011. Promoting Research Integrity in a Global Environment. pp 317-328, Singapore: Imperial College Press / World Scientific Publishing, Singapore.
Peppoloni S. & Di Capua G. (eds.), 2012. Geoethics and geological culture: Awareness, responsibility and challenges. Annals of Geophysics, 55(3), 335-341.
Pievani T., 2012. Geoethics and philosophy of Earth sciences: The role of geophysical factors in human evolution. Annals of Geophysics, 55(3), 349-353.

The Singapore Statement on Research Integrity, 2010. Second World Conference on Research Integrity, Singapore, 21-24 July 2010. Available at: http://www.singaporestatement.org/statement.html (accessed on 22 October 2014).